Vol. 15.] SEPTEMBER, 1944. [No. 3.

AGRICULTURAL JOURNAL

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NOTES FOR LIBRARIES AND RESEARCH INSTITUTES.

So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues is given for reference. Attention is directed especially to Volume VII which had only one part:—

Vol.			*Vol.*		
1.	3 numbers,	1928	8.	4 numbers,	1935–7
2.	4 ,,	1929	9.	4 ,,	1938
3.	3 ,,	1930	10.	4 ,,	1939
4.	4 ,,	1931	11.	4 ,,	1940
5.	2 ,,	1932	12.	4 ,,	1941
6.	2 ,,	1933	13.	4 ,,	1942
7.	1 number,	1934	14.	4 ,,	1943

ISSUES OF THE AGRICULTURAL CIRCULAR.

THE following were the numbers and year of issue of the *Agricultural Circular*:—

Vol. 1, 1920, 12 numbers.
,, 2, 1921, 5 ,,
,, 3, 1922, 4 ,,
Vol. 4, 1923, 1 number.
,, 5, 1924–5, 2 numbers.

As number 4 of Vol. 3 was printed as "Volume 4" and number 1 of Vol. 4 as "Volume 5" it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, Part 1.

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5. Scale Insect on Bananas, 1913.
6. Lemon Grass, 1913.
7. A Mission to Java for a Coleopterous Pest of Bananas, 1914.
8. Coconut Experiments, 1915.
9. Soils of Fiji—I., 1916.
11. Alluvial Soils of Fiji, 1919.
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    Fijian Plant Names, 1942. Price 3s. 6d., 4s. and 6s.

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—EDITOR

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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 15.] SEPTEMBER, 1944 [No. 3

EDITORIAL.

THIS issue contains the annual reports for 1943 of the Director of Agriculture and of the Entomologist, the former having already appeared as Council Paper No. 12 of this year's Legislative Council.

Among a wide selection of articles those on a method of preparing raw hide ropes according to the South African method and notes on the new insecticide dichlorodiphenyltrichloroethane or DDT are probably the most interesting to the average reader and the revolutionary results already obtained will be a great boon when DDT becomes available to the public after the war.

A general article on the post-war supplies of various vegetable oils is also of interest, the fact being stated that production of soya bean oil in the United States has increased fourteen times between 1931 and 1942. Of the 3,250,000 tons required per year in Europe it is estimated that the Allied potential supplies will be only 2,725,000 tons of vegetable oils.

For the first time for many years this issue contains an article by a Native Field Assistant which, it is suggested, is of considerable practical use and should stimulate further articles from other Fijians.

VITAMINS IN BREAD.

"IT must be realized that science travels far in advance of governments. Although the scientist now knows what food is necessary for health, his advice is seldom asked for, or followed. To the average politician and official the scientist is a theorist and not a practical man. He must be treated with respect, but his advice need be followed only if it falls in line with official views. So we still continue to remove from our wheat the part of it that is rich in vitamins, making good what we have removed by means of vitamins supplied (at considerable expense) by the dispensing chemist. Not only do we remove from the wheat the pericarp containing the vitamins, but we bleach our flour by means of alkalis that have the effect of destroying the vitamins that have escaped the miller. Having carefully removed all the vitamins it becomes necessary that we should purchase them in tablet form from the chemist. By this compromise with science the interests of the millers are maintained and the prosperity of the purveyors of vitamins is assured."

—"Human Physiology" by Dr. K. Walker, *Pelican* No. A 102, 1942, p. 43.

ANNUAL REPORT FOR THE YEAR 1943.

By
Dr. H. W. JACK, O.B.E., B.A., D.Sc., M.L.C.
Director of Agriculture.

SECTION A.—REVIEW OF AGRICULTURAL INDUSTRIES.

Climatic and General.

Rainfall was again below average but was generally adequate for all crops. As recorded in the Annual Report for 1942 a severe storm occurred on the night of December 31st, 1942, and the morning of January 1st, 1943, causing considerable loss of crop in the coconut areas of Northern Taveuni and North-Western Vanua Levu.

2. The distribution of the rainfall favoured the rice crop in most districts and provided dry harvesting conditions after a good growing period. No shortage of native food crops was reported from any district and large quantities of fresh fruit and vegetables were made available for the military forces.

3. Commercial agricultural industries: copra, bananas, pineapples and dairying, were again severely handicapped by the shortage of labour, though conditions showed a tendency to improve towards the close of the year.

4. Essential tools and materials for the repair or replacement of equipment continued to be in short supply, and transport facilities, from the outer islands particularly, were irregular and infrequent.

5. The shortage of labour reduced the quantity of produce available for export and also led to a further deterioration of lands under plantation crops and under pasture, where noxious weeds have become a serious problem.

Principal Export Crops.

6. *Sugar.*—Weather conditions were generally favourable, but unrest amongst cane farmers led to a long drawn out dispute with the controlling company which disrupted arrangements for the harvesting of cane and reduced the acreage planted. A commission appointed by the Governor made an investigation of the economics of the industry in 1943 compared with pre-war days, and reported that an increase in the price of cane to growers was not justified.

7. Grading of all copra delivered to Government's agents was carried out at Suva and Levuka, and at Savu Savu during the first half of the year, after which grading at Savu Savu was discontinued owing to lack of storage facilities.

8. There were again difficulties in securing a sufficient number of cases for the fruit available, and this was the principal factor in limiting exports. Shortage and high cost of materials handicapped shippers, and there is some lack of interest on the part of growers in necessary replanting owing to the uncertainty of the position. The f.o.b. price remained the same throughout the year despite higher costs of cases, transport and handling.

9. *Pineapples.*—There was no export of canned fruit and the limited output of the canneries was held for local consumption, also of bottled juice. Labour difficulties led to the loss of a large proportion of the crop on one estate. There was a small export of 341 cases of fresh fruit to New Zealand and large quantities were sold locally.

10. *Citrus.*—There was no export of citrus fruit as the whole of the crop was consumed locally.

11. *Cotton.*—No seed was issued and the ginneries did not operate. The remainder of the stocks of lint held over from the 1939-41 seasons was disposed of locally. In the absence of any considerable local production of kapok there is a good local demand for lint, largely for upholstery purposes, but the crop is not attractive to growers at economic prices.

12. *Tapa.*—Efforts have been made to encourage an extension of plantings of the paper mulberry as a possible export industry but, with copra prices sufficiently high to encourage production by Fijians, it is unlikely that tapa will attract interest at present.

Crops for Local Consumption.

13. *Rice.*—Despite good yields there was a shortage of rice offered for sale. This was largely due to the cautious attitude of growers who retained much larger quantities than usual as a reserve food supply.

The season was generally good and growers obtained satisfactory yields, particularly in the dry zone.

14. With extensions in plantings, the incidence of pests and diseases tended to increase and there were reports of caterpillar damage and leaf yellows disease (Sogata) from many areas. So long as the crop is entirely dependent on rainfall, wide fluctuations in yield, especially in the dry zone, will continue.

15. The effective control of rice pests by direct measures is at the present time impracticable by small farmers but the added vigour of crops on which water control is exercised by means of levelling and bunding to improve water with drainage where and when necessary, would to a large extent offset the effect of pests.

16. *Maize.*—Production was considerably increased except in the Northern Division but the extent of sales of green corn led to a shortage of maize grain for poultry and stock farmers. The grain position improved towards the close of the year when limited guarantees of purchase by Government were offered in some distrcts.

17. *Groundnuts and Pulses.*—The local price of groundnuts remained high and production was much above normal, though none was available for oil extraction.

18. The production of pulse crops was fairly satisfactory in most areas but local temporary shortages occurred.

19. *Tea and Coffee.*—Tea production fell off due to labour difficulties. Less local coffee was marketed apparently also due to labour difficulties as prices offered were attractive. There was a very strong local demand for coffee, and imports rose.

20. *Root Crops.*—The total production of root crops was adequate for all purposes but a marked shortage of dalo ensued towards the end of the year, largely seasonal but also in part due to reduced plantings. There were, however, ample supplies of tapioca (cassava) which was available as a substitute. There was no export of kumalas which were generally in short supply.

21. *Tobacco.*—Weather conditions were too dry at planting time to be favourable to this crop. Prices were high, as much as 2s. 6d. per lb being asked for leaf and 6s. 6d. per lb of home manufactured "twist."

22. *Yaqona* (*Piper methysticum*).—Plantings of this crop appear to have increased following the strong demand. Prices were generally high, 2s. 6d. per lb compared with 1s. pre-war.

23. *Broomcorn.*—Efforts have been made to encourage the production of this crop to supply material for local broom manufactures. Good quality heads can be produced but under present conditions the price offered was insufficiently attractive.

24. *Vegetables and Fruits.*—There was a further extension in planting, mainly to meet military demand, of which further mention is made in a later section of this report. Supplies to civil markets were generally adequate at prices approximately double those of the pre-war period.

Animal Industries.

25. *Dairying.*—Production in dairying fell off somewhat during the year, firstly owing to an unusually dry season in the early part of the year, and secondly to a general shortage of labour brought about by the war. Hence, less attention was given to fencing, drainage and the maintenance of pastures. The health of cattle was good and exceptionally large numbers of calves were raised.

26. Owing to the greatly increased demand for butter, little was available for manufacture into ghee by the factories. The result was a considerable shortage of ghee from this source, although there was little interference with the production of ghee as a primary product by peasant farmers. Figures for production for 1943 are as follows:—

27. There was no increase in the number of registered dairies. These are divided into two distinct groups: (*a*) those supplying milk for human consumption, and (*b*) those supplying fat to factories. Practically all of the registered dairies supplying milk are now being tuberculin tested. The test is also being extended gradually to include more of those supplying butter fat.

28. *Beef Cattle Production and Supply.*—Owing to the greatly increased demand for beef the Colony was hard pressed to maintain supplies. The price of carcass beef was fixed by the Controller at £2 per 100 lbs dressed weight, but there was reason to believe that butchers' buying agents were paying proportionately higher prices than this for cattle on the hoof. The result of the keen demand and the high prices resulted in a large number of bullocks normally worked in cultivation being sold for beef. This caused a shortage of bullocks used in sugar cane cultivation.

29. Beef cattle are produced mainly by Indian peasant farmers. A few estates are also maintained solely for the beef production while dairy farmers dispose of culls and some steers; also some cattle are purchased from coconut estates. All producers made special efforts to increase beef production and their efforts are appreciated. In order to conserve supplies of beef an administrative order was issued prohibiting the slaughter, without permission, of any cattle under three years or any female cattle under eight years of age. The same order prohibited the spaying of cows without permission.

30. The illegal slaughter of cows and young steers was very prevalent, particularly in the Nadi district. Many cases were investigated but in no case was it possible to get sufficient evidence to prosecute.

31. *Goats.*—Goat breeding proved a very profitable industry for those engaged in it. For various reasons the consumption of goat flesh increased and as much as 3s. 6d. per lb was paid for it in Nadi. The increased value attached to goats resulted in the considerable mortality which occurs amongst these animals being brought to the notice of the Veterinary Division. Wild dogs and severe parasitism are the chief causes of mortality.

32. *Sheep.*—This industry was at its lowest ebb. Not more than a few hundred sheep exist in the Colony. Heavy rainfall, long growth of pasture, wet wool and parasitism are not favourable to the well-being of sheep.

33. *Pigs.*—Pig raising, offering the quickest means of increasing the local meat supply was considerably stimulated during the year though some regular producers were forced to curtail their output because of labour shortage.

34. The greatest individual effort in production was that of the Pig Raising Scheme conducted by this Department, by which 133 pigs were disposed of for breeding and 311 for slaughter for food. Camp swill was the principal food used in the feeding of these animals.

It is difficult to estimate the total number of pigs slaughtered for food in the Colony.

35. *Poultry.*—Though statistics are lacking in regard to poultry production there was an obvious increase during the year. Supplies, however, were quite inadequate to meet the greatly increased population. The retail price of eggs was fixed at 4s. per dozen but black market trading was the rule rather than the exception and prices rose as high as 8s. per dozen, in some areas.

36. While high prices ruled there was a tendency in some areas for producers to sell all their eggs and, attracted by the high prices paid for carcass poultry, to dispose of excessive numbers of breeding stock. Peasant farmers were warned effectively of the danger of not reserving sufficient eggs for setting; also an order was issued prohibiting the export of hens from Vanua Levu or from Taveuni without a permit. This was effective in preserving breeding stock on those islands. The high prices realized for poultry and eggs proved a decided incentive to production.

37. *Fisheries.*—The product of local fisheries was quite inadequate to supply the demand for fish. No staff and no funds were available for the administration of the Fisheries Ordinance or for the fostering of the industry. Restriction on the movement of vessels by night, fuel shortage, scarcity of fishing equipment and the actual shortage of fishermen prevented any increase in production. The few attempts to fish with larger vessels and on a larger scale failed.

38. *Pastures.*—Owing to dry weather during the early portion of the year, pastures in the dry zone were poor, and resulted in some mortality from actual starvation. In the wet zone, owing to war conditions, shortage of labour led to an unusually prolific growth of noxious weeds in the pastures, fences fell into disrepair and drains became blocked.

SECTION B.—WORK OF THE DEPARTMENT.

FIELD AGRICULTURAL AND PRODUCE INSPECTION DIVISION.

Experimental.

39. Investigational work has been severely limited due to shortage of labour and the preoccupation of staff with food production. Crop variety collections have been maintained where possible, and observations on the rice variety collection have been continued. Nurseries of budded citrus plants have been maintained for distribution. A very useful survey of existing cacao in Vanua Levu, and of varieties represented there, was carried out by the Agricultural Officer Northern. A survey of rice production was initiated towards the close of the year.

Extension.

40. As in 1942, the field staff have been obliged to devote almost all of their time to the production of food crops, including greatly increased quantities of fresh fruit and vegetables for the military, and rice, maize, pulses and roots for the local population. Excellent work was performed by the staff on these duties. A brief account of the organization was given in the 1942 report. The Toga rice area was extended.

41. Demonstration farms were maintained, where possible (one of the four was virtually abandoned) and were given over mainly to the production of food crops. No attention could be given to educative or other measures for the control of soil erosion.

42. Stock trespass and crop compensation claims took up much of the time of the staff in the investigation of complaints.

Agricultural Education.

43. The recruitment of Fijian agricultural students at the Sigatoka and Nadururloulou farms was reopened halfway through the year on much improved terms which include a good conduct bonus payable at the completion of the three year course to assist the student in the purchase of farm equipment. Fijian students were recruited to full strength (per year) but very little interest has been shown by young Indians.

44. The field staff were unable to pay their usual visits of advice and instruction to district and provincial schools, except in the Northern Division, where pressure of food production work was less. The three Provincial Training farms in Vanua Levu did not reopen in 1943. The Drasa (Colonial Sugar Refining Company) and Navuso (Methodist Mission) training farms continued to function.

Produce Inspection and Marketing.

45. The field staff and Acting Inspector of Produce were fully engaged in handling the very heavy orders for fresh produce for military forces stationed in the Colony. Total deliveries amounted to 15,524,596 lbs valued at £90,000, compared with 10,530,463 lbs valued at £66,000 in 1942. This great effort was achieved mainly by small producers with from one or two chains to three or four acres each under vegetables, and the organization of seed distribution, planting, collection, bulking and delivery of this produce, with necessary arrangements for payments, has occupied the field staff to the almost total exclusion of other work. Fijian Co-operatives and Marketing Clubs afforded great assistance in marketing, as did several Chinese market gardeners and contractors.

46. The inspection and grading of copra was continued; 66,484 bags being examined at Suva, 183,793 at Levuka, and 2,591 at Savu Savu.

Green copra purchase licences were renewed and in the more accessible areas, efforts were made towards improving drying equipment, but difficulty in obtaining materials retarded progress.

47. All bananas were inspected and graded at Suva, and also small consignments of pines, water melons and other fruits. The supervision of banana licence areas and allotments for shipment was undertaken from the office of the Inspector of Produce as usual, and much time was taken up with efforts to secure an increase in production of cases and to assure the equitable distribution of the cases available.

48. Purchases of tobacco leaf were made and £672 worth of stick tobacco were manufactured and sold.

Incoming fresh produce for civilian consumption was inspected for freedom from pests and disease, and also some shipments of fresh vegetables for the Armed Forces.

VETERINARY DIVISION.

49. During the year the following stock were inspected: cattle 45,000, horses 7,000, goats 12,000, pigs 2,500, and a few sheep. All districts, except Kadavu, Lau, Rotuma and the Yasawas, were visited. No census was taken but the census figures for 1941 are given as: cattle 84,000, horses 16,000, pigs 8,500, goats 27,000, sheep 365, fowls 110,000, ducks 6,500, turkeys 1,000, and geese 350.

50. Under the Stock Improvement Ordinance animals were dealt with as follows:—

Bulls—		Stallions—	
Licensed	185	Licensed	19
Castrations ordered ..	402	Castrations ordered .	186
Castrated	242	Castrated	105

Improvement of stock by selection is slow owing to the limited scope available and in present times importations of breeding stock are much restricted.

51. The following importations arrived in the Colony: cattle 12, pigs 2, dogs 9, poultry 81, birds 6, and 1 cat. These were imported for breeding purposes and were free from disease on arrival.

52. In addition, an unknown number of dogs and other small animals were imported by military personnel by plane and were not subjected to inspection or quarantine. One dog at Nadi was found to be suffering from distemper shortly after arrival in the Colony. There is no doubt that this animal was responsible for a serious outbreak of distemper in Nadi which also spread to other areas in Viti Levu.

53. The tuberculin test was applied to 4,506 dairy cattle, of which 237 or 5·6 per cent gave positive reactions. In addition, 256 manifest cases of tuberculosis were discovered and destroyed.

54. The incidence of contagious abortion was very low—only seven positive reactors being found out of 146 agglutination tests in Lautoka. In Navua, 83 calves were vaccinated with live vaccine and evidence over several years indicates that this treatment has been successful.

55. Several cases of gangrenous mastitis (staphylococcus) occurred in Western Districts. A few cases of cancer, actinimycosis and tetanus were also recorded.

56. Infectious keretitis was prevalent with horses in the Western District, especially where flies and dust were abundant. Good sanitation and concrete floors materially reduced the incidence of this disease, which also caused mortality of calves in Colo East.

57. There were no outbreaks of bacillary white diarrhœa so that the control measures in previous years have proved successful.

58. Filariasis continued to cause heavy infection of dogs. Fouadin treatment gave some success.

59. Intestinal parasites proved one of the chief causes of debility in stock and malnutrition was also evident in the dry season due in some cases to overstocking and poor pastures.

60. Clinical examinations were made of 676 animals in Suva, 312 in Nadi and Ba, and 257 in Labasa. In addition, bacteriological examinations were made as required.

61. The dairy herd at Makogai Leper Station was tuberculin tested and again found to be free of tuberculosis. Other Government stock were also supervised as opportunity offered.

62. The Pig Fattening Scheme was adequately managed during the year and proved highly successful in the provision of fresh pork to the public.

63. The Nasinu farm was maintained as a centre of study for poultry, pigs and cattle and for educational purposes in connexion with the Industrial Reformatory School. Breeding stock is sold to the public and surplus milk is supplied to the Child Welfare Scheme under the ægis of the Medical Department. The stock included poultry 576, pigs 107, cows and bulls 67. Efforts were made to extend the pastures and a water supply scheme was established.

64. Additional brands registered number 360 and branding appears to be helpful in the prevention of stock thefts.

65. Many cases of cruelty to animals were reported to the police by the staff with beneficial results.

66. Licences were issued to fishermen but no investigational or development work was possible.

67. The management of Ricketts' dairy farm, purchased by the Services Settlement Board, was undertaken. Labour shortage made adequate upkeep impracticable.

68. In addition to advice given in the field and at the laboratories, much was given by correspondence and was promptly appreciated.

69. Two additional Stock Inspectors were appointed and proved valuable in extending general inspection and advisory work during the year.

RESEARCH DIVISION.

Chemical Activities.

70. During the year 844 analyses, involving 2,406 separate determinations, were made. The analyses were classified as follows: Agricultural, 190 samples; forensic chemistry, 167 samples; foods, 198 samples; waters, 42 samples; fuel oils, 20 samples; liquors (Police), 120 samples; (Customs, etc.), 85 samples; and "general," 22 samples.

71. Samples were submitted by the Medical, Customs, Police, Public Works and Agricultural Departments; by the Commissioner of Currency, Economic Warfare Division of the Treasury, Royal New Zealand Air Force, United States Economic Warfare Division, the Colonial Sugar Refining Company, and by private individuals.

72. Included under forensic chemistry were opium and Indian hemp samples, suspected sulphanilamide, suspected "marihuana" cigarettes, spent automatic ·45 calibre cases, bullets, shot gun cartridges, stomach contents and viscera. Indian hemp and opium were detected in eight samples and important information was provided to examining authorities in connexion with the other cases.

73. The main food examined was milk and in general the milk was of good quality. Other samples examined included canned milk, vegetables, fruits, cheese and meats.

74. A number of samples of water were examined for military authorities in connexion with the Nausori laundry scheme, etc., and for the Director of Public Works in connexion with the pumping scheme and the proposed new Rewa water scheme. Several samples of spring water were also examined in regard to suitability as a boiler feed and tests made of purification treatment for the Nausori township supply.

75. Under fuel oils, samples of petrol were examined for the Police and Royal New Zealand Air Force in connexion with Army supplies, and samples of high octane rating aviation petrol tested for the Royal New Zealand Air Force for conformance with specifications. This latter work involved determinations of density, distillation range, lead tetraethyl and aromatic contents. Samples of aviation gasoline were also examined for the United States Navy as to suitability for aviation purposes Two samples of diesel fuel were examined for the United States Navy and several samples of lubricating oil in connexion with internal combustion motors and refrigeration plants.

76. Liquors included 78 samples of rum, gin, whiskey and brandy which were examined for the Customs Department for the determination of obscuration. A further seven samples were examined for private firms. There was a great increase in samples submitted by the Police and Military Police. This work required a determination of the nature of the liquor in order to decide if it was of local origin and involved both chemical and microscopic analysis. Several samples of home-made wine and spirits were submitted by the R.N.Z.A.F.

77. Soils from the General Experiment Station, Sigatoka, and from Namaka were completely examined. The soils from Namaka were submitted by the United States Economic Warfare Division. Several soils were submitted by the Colonial Sugar Refining Company for check tests on pH and available phosphate.

78. Owing to continued staff shortages it was not possible to recommence any long term investigations such as the soil survey and food analysis in connexion with nutrition. Investigations were confined, therefore, to practical problems referred to the Department during the year. They included the following:—

(*a*) The suitability of the soils of Namaka for a truck farming scheme. This work was carried out for the United States Economic Warfare Service and involved the complete examination of selected soils from the area concerned. It was considered that the area was unsuitable without considerable outlay in fertilizers and was not in condition to give immediate returns.

(*b*) Investigations concerning the deterioration of chemicals associated with gas-proof clothing for the Force Chemical Officer. It was decided that the deterioration of a certain chemical product was due to high humidity.

(*c*) The constituents of the sap of "Sinugaga" (*Excœcaria agallocha*). This sap caused severe burns and blisters on the skins of several workmen engaged in wood-chopping and a sample was submitted by the Superintendent of Prisons for examination. An active vesicant agent was isolated from the resin constituents.

(*d*) Co-operative work was undertaken with the Chemical Staff of the Colonial Sugar Refining Company on the subject of the Rewa Cane Soils. A full account of this work has appeared in the Fiji *Agricultural Journal*, Vol. 15, Pt. 1, 1944.

(*e*) Rotenone and ether extractable constituents of derris: in continuation of previous work new strains of derris obtained from Amani grown on the General Experiment Station, Sigatoka, were examined. High percentage yields of active principles were determined.

(*f*) A complete examination including the determination of vitamin A was made on a local shark oil. The oil proved an excellent source of vitamin A.

(*g*) Local Chaulmoogra oil grown at Makogai was examined following a report of its non-conformance in certain particulars with British Pharmacopœia Specifications. The 1943 crop was found to be a superior oil agreeing in all important particulars with high quality oil. A quantity of chaulmoogra esters for the treatment of leprosy for the Medical Department for distribution to outlying stations was prepared. It is difficult at the moment to obtain a product of pharmacological purity owing to war conditions and the situation has not improved owing to the difficulty of moving lepers rapidly to a central station. The product prepared in the Chemical Laboratory is made by the hot process and purified by distillation at 1 m.m. pressure. The esters are rendered non-irritative by treatment with iodine and conform with British Pharmacological specifications.

(*h*) A reputed quinine bark called "dabi" bark (*Carapa moluccensis* or *obovata*) believed to have properties similar to quinine bark was examined and found to contain no active principles. The main constitutents were tannins.

(*i*) In connexion with the R.N.Z.A.F.'s enquiry concerning the detection of army petrol in admixture with civilian petrol an interesting method involving chromatographic absorbtion of characteristic dyes was developed resulting in successful prosecutions.

79. The laboratory equipment which has been built up during the past decade was well maintained. In addition, modernized time-saving equipment has recently been ordered, especially in connexion with nutrition studies, and the library has been augmented. Several interesting articles were published in the local *Journal* by the Senior Chemist. On four occasions the Senior Chemist appeared in the Supreme Court as a witness and issued over 100 certificates and four affidavits for the courts of the Colony.

80. Laboratory facilities were extended to U.S. Army Chemists during the year and this service was officially appreciated by the Commanding General.

81. Two-thirds of the qualified staff, being away on war duties, remained absent from the laboratory during the year and the Senior Native Attendant was absent for health resons for six months. Despite staff shortage, however, a heavy programme of work was accomplished.

Entomological Activities.

82. During the year special attention was given to the control of the insect pests of vegetables and fruit, and demonstrations of treatments were conducted where deemed advisable, and insecticides and sprayers were made available to market gardeners.

83. The two common fruit flies (*Notodacus xanthodes* and *Chætodacus passiflorœ*) were recorded for the first time from ripe breadfruit in which the grubs matured in the hanging fruit.

84. Cutworms did not prove a serious pest in the rice fields, but the leaf hopper (*Sogata furcifera*) was destructive in certain areas.

85. A solitary male cabbage white butterfly was captured in the Suva wharf area. This is a serious pest that is not yet present in the Colony.

86. Through the courtesy of the Dominion Entomologist, New Zealand, a colony of the parasite *Diadromus collaris* was secured and some 700 individuals were released over a period of six months for control of the diamond back moth—a serious pest of cabbage and turnips.

87. The breeding of the larger wasp parasite (*Dirhinus*) of fruit and carrion flies was continued, approximately 28,000 being released during the year.

88. Mosquito surveys were continued, special attention being given to aerodromes in order to check on the possible introduction of the malaria mosquito from Melanesia.

89. The collection of insects of economic importance was maintained in good order. Despite postal difficulties numerous identifications of insects were made by the Imperial Institute of Entomology.

Botanical.

90. The Botanist was fully employed on food production work for the Forces and hence was unable to devote much time to botanical work. He lectured to the Forces on two occasions and a number of copies of an article dealing with useful plants of Fiji were distributed to soldiers and other interested persons.

91. Field and laboratory equipment were maintained in good condition and the herbarium was materially augmented.

92. Promising varieties of the chief crop plants such as yams, dalo and rice were maintained, though experimental tests had to be omitted owing to pressure of other work. Advice was given as to the treatment of several diseases of crop plants and overseas correspondence was maintained.

General.

93. The library was maintained in good order and a number of useful additions were made during the year. The Entomologist again functioned as Librarian.

94. Regular quarterly issues of the Fiji *Agricultural Journal* were maintained and appreciations of the *Journal* were received from local readers. The Entomologist continued as editor of the *Journal* and appreciation of this service is recorded.

95. Information, advice and planting materials and livestock were made available to Western Pacific High Commission Territories as required.

96. It is a pleasure to record that the work of the Department has been materially assisted by District Commissioners, other District Officials, officers of the Customs Department and the Colonial Sugar Refining Company. Their prompt and valuable co-operation is appreciated.

97. In conclusion I would place on record the loyal and industrious support constantly given by the staff of all races, during a difficult year. In the face of many difficulties, in the absence of ordinary leave facilities and with additional work thrown on them arising out of the war, they have carried on cheerfully in a manner which ensures harmonious relations outside as well as inside the Department.

H. W. JACK,
Director of Agriculture.

RAINFALL RECORDS FOR 1943.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Rarawai ..	13·20	7·65	11·15	9·49	9·95	1·19	0·00	·98	4·13	9·77	6·21	7·37	81·09
Nadi (1) ..	6·25	2·81	8·16	13·21	7·0	0·95	0·13	·84	3·53	10·24	5·99	2·58	61·69
Nadi (2) ..	4·95	5·62	8·10	14·19	11·24	0·90	0·25	1·07	3·12	..	12·01	5·91	..
Sigatoka ..	3·71	6·95	12·29	10·96	8·17	1·37	·67	·59	3·03	8·22	8·90	5·24	70·16
Nasinu ..	12·80	8·68	9·65	34·80	8·49	1·36	2·74	2·25	3·24	6·71	18·79	9·98	119·49
Navuso ..	15·25	16·38	8·00	20·84	9·20	·29	2·29	3·29	2·68	8·86	18·37	15·75	121·20

DIVISION OF ENTOMOLOGY.

ANNUAL REPORT FOR THE YEAR 1943.

By
R. J. A. W. LEVER, B.Sc. (Hons.), D.I.C., A.I.C.T.A., F.L.S.,
Entomologist.

I—Staff and Leave.

One of the two Native Laboratory Attendants was given two months' local leave. Three Native Assistants were taken on in connexion with the Anti-Mosquito Campaign financed by the Medical Department.

II—Chief Pests.

Plutella maculipennis (Curt.) on cabbage and turnip; *Crocidolomia binotalis* Zell. on cabbage and radish; *Margaronia indica* Saund. on pumpkin leaves; *Maruca testulalis* Geyer on French bean pods; *Zizera labradus mangoensis* Btlr. on bean flowers and pods; *Epilachna vigintioctopunctata* F. on potato, cabbage and brinjal (egg plant) leaves; *Cylas formicarius* F. on sweet potato tubers; *Adoretus versutus* Har. on rose leaves; *Sogata furcifera* Horv. on rice; *Mictis profana* F. on orange shoots; *Aulacaspis cinnamoni* Newst. on rose stems; *Nezara viridula* L. *smaragdula* F. on bean pods and *Chaetodacus passiflorae* Frogg and *Notodacus xanthodes* Broun in breadfruit and orange. On stored products and miscellaneous materials were: *Lasioderma serricorne* L. on chopped cabbage and beans (dried as emergency foods); *Calandra oryzae* L. in stored wheat; *Bruchus obtectus* Say in bean seeds from New South Wales and *Catorama herbarium* Gorh. in book covers and leather suit-cases. Sucking pests of mammals were *Cimex hemipterus* F. in army camp stretchers and a civilian mosquito canopy. *Ctenocephalus felis* Bouché from floors of an evacuation hospital; *Culicoides mollis* Edw. at a radio station; *Aëdes vexans* Meig., *Culex annulirostris* Skuse and the usual household mosquitoes and the dog tick *Rhipicephalus sanguineus* Latr. sheltering in concrete walls. The carrion fly *Lucilia cuprina* Wied. was taken in large numbers on pig dung but was not found breeding there

III—Introduced Parasites and Predators.

Releases for six months of the egg parasite *Microphanurus basalis* Woll., against *Nezara* totalled 11,880; absence of hosts prevented mass breeding before June. A consignment was sent by plane for the third time to New Caledonia Through the Cawthron Institute of Nelson, New Zealand, a larval and pupal parasite of *Plutella* was received, this insect is *Diadromus* (*Thryaella*) *collaris* Grav. and 694 were released including a consignment sent by plane to Tonga. The Copriid beetle *Platylister chinesis* Quensel. was liberated in greater Suva, Nasinu, Nausori and Taveuni (a total of 1,190) for control of house flies in cow droppings The lace bug *Teleonemia scrupulosa* Stal. was sent to Tailevu and Navua for control of lantana which, however, usually gets ahead of this insect in the wet zone. The large Indian Chalcid *Dirhinus*, introduced in 1937, has not been recovered since and after 27,900 had been released by the end of July mass breeding was discontinued so as to concentrate on *Diadromus*. Work on the small fruit-fly parasite, *Melittobia indicum* Silv., was continued, 20,150 being released.

IV—Indigenous Parasites and Predators.

The Eulophid *Hemiptarsenus semialbiclavus* (Gir.) was reared from larval *Phytomyza spicata* Mall. in maize leaves and a species of *Eucoila* (*Eucoilidea*) from larval *Liriomyza strigosa* Meig in sweet potato leaves.

The Ichneumon *Diplazon* (*Bassus*) *laetatorius* F. was found parasitising *Syrphus corollae* F. *vitiensis* Bezzi which is in turn a predator on the Aphid *Rhopalosiphum nymphae* L. on water hyacinths and rice stalks. *Apanteles expulsus* Turner and *Mesochorus* were bred from larval *Plusia chalcites* Esp.; an unidentified *Apanteles* and *Chelonella* from larval *Crocodolomia binotalis* Zell. and *Opius* sp. near *tryoni* Cam. from *Notodacus xanthodes*.

V—Mosquitoes.

Survey of aerodromes and inspection of planes for *Anopheles* were carried out, none being found; this latter work was due to the courtesy of the United States Air Force. The swamp-loving *Culex annulirostris* Skuse was the most widespread mosquito with *Aëdes vexans* Meig. common in broken ground and *Culex fatigans* Weid. in drains. Full details cannot yet be given for security reasons. Larvæ of *Mansonia brevicellulus* Theo. were found in a swamp tapping the roots of *Eleocharis* sp. near *articulata* Steud; this larva had not been taken before in Fiji. The dappled *Aedomyia catasticta* Knab. was taken in the River Nadi close to the bank associated with the alga *Nitella* ; this is a new record for Fiji. A survey of the Suva peninsula was also made and 12 out of the 15 indigenous species were found within that part of the Peninsula southwards of a line joining Delainivesi through Tamavua to Samabula. The Entomologist attended seven meetings of the Quarantine and Public Health Committee on which service members of the United States and local armed forces sit, mosquito control being dealt with among other subjects.

VI—Insecticides and General Control.

Continued help has been received from the United States authorities who were able to obtain insecticides otherwise unprocurable. Large sales of Black Leaf 40 and lead arsenate, and, to a much less extent, of derris, pyrethrum and tobacco waste were made to Chinese market gardeners. Spraying pumps were also sold to these gardeners and released to Agricultural Officers and lent to mosquito inspectors. Sodium silicofluoride was sold for cockroach control; white oil used for scales, carbon bisulphide for weevils, book varnish for beetle borers, calcium arsenate for snails and white arsenic for rats.

VII—Miscellaneous.

A solitary male *Pieris rapæ* L. was taken in flight in the Departmental grounds near the Suva wharf. Specimens of the Copriid beetle *Copris incertus*, which were sent to Western Samoa in 1934, were identified for the Produce Inspector, Apia. Information on inspect pests of the British Solomon Islands was given to a newly appointed Agricultural Officer and notes on health and other conditions there supplied to Headquarters of Surgeon, United States Army Forces in Islands of South Pacific Area. Information on nutfall in coconuts caused by parakeets was supplied to a planter and details about local bees was sent to Canada. An overseas steamer direct from Samoa was inspected for possible specimens of *Oryctes rhinoceros* in her hold; she was not infected.

VIII—Identifications.

The writer gratefully acknowledges the assistance received from the Director of the Imperial Institute of Entomology, London who had 252 (142) insects identified (figures in brackets are for 1942). Of these 13 (12) species sent were previously unrepresented in the National Collections and 4 (8) were new to science. Assistance has also been received from Mr. E. C. Zimmermann of the Bishop Museum, Honolulu and Dr. C. F. W. Muesebeck of the United States National Museum, Washington.

IX—Publications.

Twenty-five articles and notes were written for the *Agricultural Journal* including one which recorded the Division's history since 1906. This periodical was edited; as usual four numbers appearing during the year. An article on insect pest control was written for a local Chinese newspaper and one on the toad for a school periodical. A second article on the fauna of the British Solomon Islands was published in *Tropical Agriculture*, Trinidad, B.W.I., February, Vol. 20, No. 2.

X—Weather.

The rainfall recorded at Laucala Bay was 88·44 inches, being 32·42 inches less than the average for the last fifty-seven years There was a drought from June to September. Data in parentheses are for 1942. June (January) was the driest month with 1·28 (1·71) inches and April (April) the wettest with 21·53 (24·82) inches. The hottest month was March (March) with a mean temperature of 80·5°F. (80·4°) and the coolest July (September) with a mean of 72·8° (73·4). There were no hurricanes but a warning was issued for a threatened one in mid-December. Other rainfall records appear at the end of the Director's report.

FISH FARMING IN A SEA LOCH.

An interesting article appeared in a recent issue of *Nature** describing an experiment in fish farming based on the assumption that the fertility of the sea was largely dependent on the same factors as that of the land or of freshwater fish ponds, namely light and plant nutrients and that fertility could be improved by augmenting with artificials the amount of nutrients available to plant growth.

The experiment led to the conclusions that the initial assumptions were correct, i.e. that low productivity was due to scarcity of plant nutrients, namely nitrogen and phosphorus.

The results of the applications of sodium nitrate and superphosphate indicated rapid utilization of those fertilizers, which opens up new possibilities for marine fish farming.

The conclusion of the article states that " application of fertilizers, combined with hatching operations, might become a practical means of improving the yield of inshore fisheries, and lead to a future when fisheries will follow the path of agriculture, when development and production will take the place of conservation and restriction." (It is hoped that it may be possible to continue freshwater fish culture experiments in Fiji after the war—experiments were initiated at the beginning of the war but lack of transport and non-availability of fertilizers nullified the experiments.) —H.W.J.

* *Nature*, No. 3886, April 22, 1944.

ENTOMOLOGICAL NOTES.

By
R. J. A. W. LEVER, B.Sc. (Hons.), D.I.C., A.I.C.T.A., F.L.S.,
Entomologist.

1. *CULEX SITIENS* WIED. BREEDING IN SEA WATER.

THROUGHOUT the Pacific region *Culex sitiens* Wied. is well known as a mosquito which breeds in brackish or saline water. During June the writer found its larvæ in concrete tanks holding sea water in which spare lengths of marine cable were stored. The tanks were subsequently thoroughly drained and then refilled with undiluted sea water. Fifteen days later *Culex sitiens* larvæ were found in this water and subsequently reared into adults. In view of the interest of this observation egg rafts, found in the same brackish pools at Vatuwaqa previously referred to (1), were transferred into pure sea water collected from Suva Harbour and from these adults were reared sixteen days later; when repeated the period was thirteen days.

This mosquito has previously been dealt with in some detail in Australia by Hill (2) and by Cooling (3) who reared it from tidal creeks and salt marshes and pools, and by Buxton in Samoa who took it in holes in coral containing partly rain water and partly sea spray (4). So far as the writer can ascertain this seems to be the first record of this mosquito breeding in undiluted sea water but it is to be stressed that this only occurs in stagnant water with no tidal movement.

Two samples of these waters, submitted to the Senior Chemist, were analysed as follows:—

	Sodium chloride per 100,000.
Water from concrete tanks where larvæ found	2,080 parts.
Water from Suva Harbour in which larvæ reared..	3,040 „

Although Wigglesworth (5) showed in 1933 that the so called anal "gills" functioned only secondarily as respiratory organs yet recent references still continue to infer that they are true gills for breathing as in marine worms, Crustacea, fish and tadpoles. It is, however, for absorbing chlorides in the water that these organs are used and it is better therefore to use the term papillæ rather than "gills." Wigglesworth proved six years ago (6) that by lowering the chloride content of the water the papillæ in individual larvæ were lengthened in an effort to absorb the lessened amount of chlorides then present. Hence it is that mosquito larvæ frequenting salt or brackish water (e.g. *Culex sitiens*) have small papillæ while those living in fresher, less saline water require larger papillæ whether the source is tins (*Aëdes ægypti*) or tree holes (*A scutellaris* and *Tripteroides purpurata*).

REFERENCES.

(1) Lever, R. J. A. W.—1943. *Agric. Journal*, Fiji, Vol. 14, No. 2, June, p. 42.
(2) Hill, G. F.—1922. Service Publication, No. 21, Dept. of Health, Commonwealth of Australia, p. 23.
(3) Cooling, L. E.—[1924]. Service Publication No. 8, (Tropical Division), p. 37.
(4) Buxton, P. A.—1927. "Researches in Polynesia & Melanesia", London School of Hygiene & Tropical Med.
(5) Wigglesworth, V. B.—1933. *Jour. Exp. Biol.*, Vol. 10, pp. 16–26.
(6) Wigglesworth, V. B.—1938. *Ibid.*, Vol. 15, pp. 235–247.

2. THE GREEN VEGETABLE BUG, ITS FOOD PLANTS AND EGG PARASITE.

Since publication of the local food plants of the green vegetable bug, *Nezara viridula* L. *smaragdula* F., in 1940 and 1941 (1 and 2), this pest has been found feeding on pods of *Crotalaria mucronata* Desv. at Nadi.

This legume is also known as a food plant in Montserrat, B.W.I.(3) and I am indebted to Mr. W. Greenwood, F.L.S., for kindly determining the species; *mucronata* has priority over the more commonly used *striata* D.C. or *saltiana* Andr.(4). Other new local food-plants are cabbage and beet leaves, tobacco stems, *Capsicum* and sweet potato vines.

The developmental periods of the egg parasite *Microphanurus basalis* Woll. from 1941 to 1943 were in the cool season 14–14½ days for July (72·8° to 73·9°F.) and in the hot season 8½ days for March (80·4 to 81·8°) thus agreeing closely with those given earlier (5). It will be seen that there is a difference of 7·6° to 7·9°F. between the seasons.

Following on this parasite having been sent by plane to Tonga in 1941 and to New Caledonia in 1942, it was thought advisable to see how it withstood retarded development in the event of a plane service not being available. Accordingly parasitized egg-clusters were held at approximately 46–52°F. for 12 days in October 1943 but 6 out of 80 *Microphanurus* emerged, the total period from oviposition to emergence of parasites being 24 days. This shows that a less drastic cold storage should enable a reasonable number of adults to survive if held for less than a week.

REFERENCES.

(1) Lever, R. J. A. W.—1940. *Agric. Journal*, Fiji, Vol. 11, No. 2, p. 40, and No. 3, p. 81.
(2) Lever, R. J. A. W.—1942. *Ibid.*, Vol. 13, No. 3, Sept. p. 81.
(3) Myers, J. G.—1931. Empire Marketing Board Publication, No. 42.
(4) Smith, A. C.—1942. *Sargentia*, I, 2, p. 39. Massachusetts, U.S.A.
(5) Lever, R. J. A. W.—1942. *Agric. Journal*, Fiji, Vol. 13, No. 1, March, p. 25.

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3. INSECTS ASSOCIATED WITH BATS AND BAT GUANO.

Some two years ago the writer dealt (1) with a parasitic fly he took from the fur of a small bat (*Emballonura semicaudata* Peale) and, following Thompson's paper, identified it as *Nycteribosca scutellaris* Jobling. Although this ectoparasite was taken in March 1942, its identification has only recently been received from the Imperial Institute of Entomology, London, and it proves to be the closely allied *N. buxtoni* Falcoz and this correction is now published. As mentioned in the earlier paper, *N. buxtoni* was first taken in Western Samoa from the same host, the island being Upolu; the Fijian locality was a small cave along the impressive Waiqa Gorge in a tributary of the River Wainimala.

Two additions to the insects associated with bat guano, (exported to New Zealand for its tricalcic phosphate content) referred to last year (2) are the Muscid flies *Atherigona excisa* Thoms and its subspecies *A.e. trilineata* Stein. These have previously been taken from such damaged plant remains as rotten cauliflowers, cotton bolls, banana flowers, avocado fruit and maize leaves and so can be regarded as attracted to both animal and plant refuse.

Some small moths have also been reared from the guano but owing to evacuation from London of the type specimens of the families concerned it is not yet possible for them to be identified.

REFERENCES.

(1) Lever, R. J. A. W.—1942. *Agric. Journal*, Fiji, Vol. 13, No. 2, June, p. 49.
(2) Ditto—1943. *Ibid.*, Vol. 14, No. 4, December, p. 102.

4. RECENT REVISION OF SCIENTIFIC NAMES OF SOME LOCAL INSECTS AND PLANTS.

SYSTEMATICS, or the science of nomenclature of animals and plants, is like all other sciences subject to change and consequent revision as more and more work is carried out. Certain names of insects which have been in use for years are periodically found to require revision and the following list gives some of economic importance which it is convenient to bring together for reference, even though a few have been published previously:—

"*Phibalocera pythonius* Westw.", the large stick insect, is now *Hermachus*.

"*Graeffea* (*Lopaphus*) *coccophagus* Newp.", the small stick insect of coconuts, is *G. crouani* (Le Guill.).

"*Tectocoris lineolata* F.", the cotton harlequin bug, is *T. diophthalmus* Thunb.

"*Lepidosaphes lasianthi* Green = *L. auriculata* Green", the croton scale, is *L. tokionis* Kurawa.

"*Teleonemia lantanae* Dist.", the lantana lace bug, is *T. scrupulosa* Stahl.

"*Neda tricolor* Crotch", the large orange-coloured ladybird, is *Archaneda tricolor fijiensis* Crotch.

"*Terias hecabe* Btlr.", the black-tipped sulphur butterfly, is correctly *Eurema hecabe sulphurata* Btlr.

"*Syntomosphyrum indicum* Silv.", the introduced fruit fly parasite, is now *Melittobia*.

The *Apanteles* recorded from Natova in this *Journal* for June 1941, (Vol. 12, No. 2), as *A. antipoda* Ashmead should be the different species *A. expulsus* Turner, these not being synonymous.

In dealing with various plants attacked by insects, some discarded names have previously been used and there are similarly corrected:—

Several years ago the blue rat tail was referred to impartially as *Stachytarpheta indica* (L.) Vahl. or *S. dichotoma*, after that as *S. jamaicensis* L. (Vahl.), it is, however, correctly classified as *S. urticaefolia* (Salisb.) Sims.[1] The name of that other curse, lantana, is settled as being *Lantana camara* L. var. *aculeata* (L.) Moldenke, "*L. crocea*" not apparently occurring in Fiji.[1]

The pernicious "mile-a-minute" is still often referred to incorrectly as *Mikania scandens* Willd. though shown by Caun in 1940[2] to be *M. micrantha* H.B.K. This usage caused Smith[1] to state it "has not previously been recorded from Fiji" though actually it had been and for many years before his paper was published.

The so-called "Noogoora burr", recorded since 1918 as *Xanthium chinense* L., has been shown by Greenwood[3] to be really *X. italicum* Moretti.

Finally, the name *Pometia* given in the March issue, p. 15, as a synonym of *Spondias* is incorrect and should be deleted.

REFERENCES.

(1) Smith, A. C. *et al.*—1942, *Sargentia*, I, II. Harvard University.
(2) Caum, E. L.—1940 *Hawaiian Planters' Record*, XLIV, 4, p. 243.
(3) Greenwood, W.—1943 *Proc. Linn. Soc. Lond.* 154, Pt. 2, February, p. 92.

5. DDT AS A MOSQUITO LARVICIDE.

In the middle of January 1944 the writer received by air mail from London a few ounces of the then secret DDT, a fine white powder of the greatest toxicity to insects.

Elsewhere in this issue is a description of this substance (now removed from the secret list) which has the chemical name of dichloro-diphenyl-trichloroethane and in this article some notes are given on the first experiments made with it in Fiji for killing mosquito larvæ.

As information was required on its relative effect in a 5 per cent solution with oil compared with the usual oil by itself, two equal areas of swampy ground at Nasese were sprayed with the two solutions, the amount of oil being similar in both cases and the type of ground and density of the larvæ (*Aedes vexans* Wied.) being as nearly uniform as could be found. It was specially asked that an area with growing grass in the water should be selected so as to make the test as exhaustive as possible, the grass naturally acting as an obstacle to the even spread of the oil film. Two large white enamel trays had been placed in the centre of each of the sprayed areas and 29 larvæ were found in the tray in the DDT area compared with only 17 in the straight oil—a light diesel.

The member of the staff of the London School of Hygiene and Tropical Medicine who had sent the sample asked if the following experiment could be made: Two similar tubs full of water were required to be placed near each other in the open, one exposed to rain and the other protected by a light roof. Two cubic centimetres per square yard of 5 per cent DDT in any non-volatile mineral oil were then to be sprayed on the surface of each and the effects noted.

Difficulty was found in getting two equal metal containers which both gave a surface area of a square yard and in the end a drum halved lengthwise was used giving an area of only 2 feet 8 inches by 1 foot 10 inches. Into these were introduced equal numbers of larval *Aëdes scutellaris pseudo-scutellaris* and *Culex fatigans*, the drums being almost full. A week later it was found that after spraying with 2 cc. all larvæ in the sheltered drum were dead but all those in the exposed one were alive. This was due to the experiment being made from the end of January and beginning of February when in two days 14·52 inches of rain were recorded, these two days being only five days apart. This naturally caused the exposed drum to overflow carrying the oil film with the excess water and so leaving only untreated water behind.

This experiment was modified in June and it was seven weeks before eggs were found in the drum with the oil alone whereas after twelve weeks there had been no egg laying in the DDT plus oil drum. The surface of the water was seen to be covered with a layer of dead mosquitoes, midges, other flies, bugs, moths and ants showing its general insecticidal value. The half drums had to be painted inside in order to stop flake rusting which was an unnatural factor not to be found in the field.

Another field trial was made in March selecting a disused soapstone air-raid shelter with water within to a depth of some two feet. In this case 4 cc. of 5 per cent DDT in Diesel oil were used and the day following application no live *Culex fatigans* larvæ could be found in the water which had given several larvæ per dip before application of the oil. This was repeated in a soapstone drain with similar results, the same species of mosquito being present.

The last experiment was made in a patch of swampy and weedy ground partially covered with twigs and grass cuttings which had been reported by the nearest householder as being a source of breeding of night-biting mosquitoes. The species proved to be *Culex fatigans* and *Culex annulirostris* and DDT was applied in one part as a 5 per cent solution in oil and elsewhere dusted, one part of the powder to nine parts of finely-ground soapstone. Two days later the site was examined and no larvæ could be found, thereby showing a good and cheap control.

From the foregoing it is seen that this substance is quite suitable as a mosquito larvicide in Fiji with its rainfall of 120 inches per year (Suva) and a humidity of 74 to 84 per cent. When supplies are available after the war it should be of great value as one quart of oil plus DDT will usually be as effective as 10 to 14 gallons of oil alone. This should enable spraying marshes to be economic as is often now not the case.

REVIEW.

THE NEW INSECTICIDE DDT.

ONLY recently lifted from the secret list is a new white powder which already shows promise of doing in the realms of economic entomology what the sulpha drugs have recently done in medicine. Although first prepared in 1874 in Germany it was not until this war that its value as an insecticide became apparent and since then its success has been astonishing. This powder is chemically known as dichloro-diphenyl-trichloroethane, popularly as DDT and its uses are so varied that it may well be regarded as the answer to the entomologist's dream for the complete control of insect pests.

Already of historic importance is the check and control of typhus or gaol fever early this year in Naples, by dusting with DDT the swollen population of this large city. Some other authenticated claims for this substance are:—

Complete freedom for four months from bedbugs in a barracks.

Reduction by 95 per cent of horseflies in milk barns

One hundred per cent kill of the stable fly on horses which are made repellent for several days; similar results against fleas on dogs and on goats. Promise for control of buffalo fly in Australia.

Good control of cockroaches, ants and termites as well as against caterpillars on fruit and thrips on flowers

About the only failures so far are certain beetles, the cotton boll weevil and fruit-flies.

No price can be given yet as the demands by the armed forces are so great that supplies cannot be released for civilians. This, then, is another "Freedom" to look forward to after the war—freedom from insects in our houses and gardens!

It is interesting to note how DDT ceased to be secret: early this year one American paper was unable to mention the name DDT while another paper, printed in the same building, was able to do so the same week through a more understanding censor in Italy. Although June 1944 was the month when the embargo was officially lifted the writer has a copy of a technical journal published in February with full details of experiments carried out with DDT on various insects.

For local experiments carried out on the control of mosquito larvæ begun in January 1944 the reader is referred to another part of this journal.

—R.J.A.W.L.

A METHOD OF PREPARING ROPE FROM HIDES.

By
H. T. B. HALL, B.V.Sc.,
Acting Senior Veterinary Officer.

DUE to the war, rope has become very difficult to obtain in Fiji and it is unlikely that adequate supplies will be available from overseas from some time yet.

With a view to overcoming this shortage the following extract from the *Handbook for Farmers in South Africa* will no doubt be of interest to farmers here. The extract describes a method of braying "riems" which are rawhide ropes used as harness for bullocks and in many other ways, in place of hempen rope in South Africa.

"Remove the skin carefully from the carcass, salt it properly, and leave in the shade to dry, Spread it out evenly, but do not stretch it. The farmer is not always able to proceed immediately to remove the hair from the skin, and it may be dry and hard before he can attend to it. In such circumstances the skin should be properly soaked in rain or soft water to restore its flexibility. If the skin is wet any one of the following three methods can be used with advantage:—

(1) *Earth Method.*—Roll up the skin with hair inside. Make an opening in the ground about six inches deep and place the skin in it. The ground that was removed is then well moistened and replaced on top of the skin. Inspect at frequent intervals to see whether the hair is coming off. Note especially the hair at the belly, because it is the firmest; directly it comes off, the skin should be taken out and the hair scraped off.

(2) *Manure Method* —This method gives very satisfactory results, but the work should be carefully carried out as otherwise the skin is likely to decay or be damaged. The skin is simply folded up and placed between fresh manure. When the hair comes off, the skin is taken out and the process of braying commenced.

(3) *The Bran Method.*—Experience has shown that this method is the safest and the best of all decomposition methods. Prepare a thin mixture of wheat-bran and rain or soft water, and in it immerse the skin. The skin is then folded up and placed in a tub, and after twenty-four hours it will be possible to remove the hair from the skin. This method has several advantages. The skin does not decay so readily and it has a white and clean appearance. In loosening the hair the skin should be allowed to decompose to a certain degree, but precautions should be taken in every instance not to allow the process of decomposition to go too far, for it may decrease the value of the skin. The use of lime or alum or both is not recommended because it makes the skin too brittle: the riems cut from the skins are soft, but they remain dry even though treated with fat.

It is the general practice to stretch the skin directly the hair has been removed and cut it into riems. The corners of the hide are cut off and one long riem 1½ to 2 inches wide (according to the thickness of the skin) is cut by beginning at the outer edge and proceeding round and

round in a spiral until a small fragment remains in the centre, which is not suitable for riem-making. Such a riem is 70 to 80 yards in length. It is thrown over a strong branch of a tree. The one end is passed through a loop attached to a heavy stone or wheel, and is slung across the branch again and passed through the loop until eventually the whole riem has been wound up. The two ends of the riems are then fastened together" (A suitable weight with loop could be made by lashing a strong short stick with a bend in it to a heavy stone or other suitable weight. The stick should be tied at both ends. The riem could then be passed between the stone and the stick. H.T.B.H.)

"A second method is to cut the hide into strips longitudinally, and at each end of each strip or riem a hole is cut. An old riem is passed through all these riems and tied to the branch of a tree, and at the other end the riems are fixed in a similar manner to a heavy stone.

A third method is to bray the hide without cutting it into riems. Both at the top and at the bottom part of the hide, holes are made six inches apart, through which a riem is passed, and both ends are tied in similar manner to the branch of the tree and heavily weighted as described above.

The same process of braying is applied in all three cases. A stick about eight to ten feet long is passed through the lower end of the loop. The stick with the attached weight, is turned round and round until the riems are twisted very tightly, somewhat like a rope. The stick is then released. The weight causes the twisted bundle of riems to unwind, but the motion is continued by the action of the heavy weight which twists the riems again in the opposite direction. It is again allowed to unwind and the operation again repeated. If the hide is fairly wet, the water will be pressed out by the twisting.

This process of twisting and unwinding should be kept up for two or three days, and fat should be applied when the riems become dry. The braying process will be finished when the core of the hide (on making a cut into it) shows a whitish colour."

Hides have been used locally in place of *magi-magi* or sinnet for Fijian house building as well as in connexion with dairying and cattle, and a common method of preparation is as follows:—

The fresh hides are beaten with sticks to clean them, then soaked in swamps until the hair becomes loose enough to scrape from the hide. The hide is then dressed with some oil or fat—a good mixture being formed by heating together 2 lb of tallow, ½ lb of beeswax and one gallon of coconut oil. The hide is then cut into strips, usually about three inches wide and hung in a cool airy place to stretch—stretching being commonly assisted by tying weights to the strips. After being stretched, the strips may be plaited into ropes, stock whips, belts, etc., or used as a substitution for leather for repair work of harnesses. For whips and finer ropes the stretched strips are usually cut narrower than three inches before plaiting.

It is recommended to farmers who are able to obtain hides that one of the above methods be used to manufacture a rope suitable for all purposes where hempen rope is normally used. The amount of labour required is not great, and no special skill is needed to carry out any of the methods described.

AGRICULTURAL NOTES.

1. CULTIVATION OF GROUNDNUTS OR PEANUTS (*ARACHIS HYPOGAEA*).

By
TANIELA R. SAUKURU,
Native Field Assistant, Suva.

Preparation of Land.

The best time for planting peanuts is during the months from May to July. The land must be well and deeply prepared by digging or ploughing. If ploughed then harrow it thoroughly so that the soil becomes fine, the best soil for planting peanuts is a light and sandy one.

Seed Selection.

Before planting the peanuts you must decide which kind to plant, the large or Chinese variety is best if you wish to grow for eating, while the small variety is best to grow for oil. Choose good and sound seed, if you do not do this you will not get good results.

Planting.

When the land is ready, you must decide on the method of planting, either—

(*a*) you can plant by mounds like you do for kumala and tapioca, set at 2–3 feet apart; or

(*b*) in lines, setting the lines 2 feet apart and planting the nuts 12 inches apart in the lines, two nuts in each mound or every 12 inches and the depth about 2 inches. Do not plant too shallow otherwise the birds and rats will eat them.

Cultivation.

You must hoe your garden so that the weeds are not allowed to grow. When the plants are two or three months old hoe on both sides of the lines, drawing the soil towards the plants to earth them up, so that when the flowers are set they will have soft and fine earth just under them to bury the nuts in and help to mature them. The crops will mature in from four to five months after planting.

Harvesting.

Harvesting should be done in fine, dry weather, by hand, using the fork for digging on all sides and under the plants so that the ground is loosened. Then gently raise the plants so that they are easily pulled out of the ground. When the plant has been pulled up, turn it down so that the sun may dry and cure the nuts. Collect each day's harvest, put into a dry shed until the harvesting is finished. Then carefully thresh the plants to separate the nuts and then lay them out in a thin layer in the sun for a day or two to dry and ripen, finally collecting and bagging them. Yield per acre varies from as low as 400 lb of nuts to as high as 1,500 lb. Finally this plant belongs to the family of plants which are able to get nitrogen from the air, and store it in its roots so that when the crop is harvested the roots and remainder of plant should be dug or ploughed into the soil, so that the value of the nitrogen stored in the roots may be returned to the soil as manure for the benefit of the next crop.

This plant is therefore of great service in rotation of crops.

2. WASTAGE IN BANANAS.

In regard to the handling of ripe bananas, it may be of interest to record the good work performed by the Nausori Fijian Co-operative Market in reducing wastage to very low figures.

During April, which was a typical month, the Market purchased 47,239 lb of fruit in bunch form. After ripening the bunches without any facilities for holding even temperatures, stripping the bunches and packing the individual fruits into standard cases, the total losses only amounted to 5,967 lb or 12·6 per cent of the total.

The other local contractors for the supply of bananas claim that wastage commonly amounts to 40 per cent. Hence the Nausori Co-operative Market is to be congratulated on its efficiency in handling large quantities of bananas with such small losses. —H W.J.

3. POST-WAR SUPPLIES OF OILS.

In an article in the *Crown Colonist* for April 1944, Mr. J. C. A. Faure, chairman and managing director of Messrs. H. M. F. Faure & Co., Ltd., London, examines some of the problems of provisioning the world, more particularly Europe, with oilseeds and fats in the years immediately following the cessation of hostilities in Europe, though he points out that in view of the many unknown and indeterminable factors an actual forecast would be most hazardous.

The author points out that, because of the known fact that livestock in Europe have been reduced in numbers to a level from which it will take many years to build herds up again to normal, the demand for cake and meal will be greatly reduced. For this reason the demand will be for the importation of oils and high oil-yielding oilseeds such as copra, palm kernels and groundnuts at the expense of soya beans and cottonseed which yield only 15 to 17 per cent of oil and 83 to 85 per cent of cake, normally a profitable by-product. Such "straight" oils (whale oil, sardine oil and expressed oils) together with high oil-yielding seeds will probably be in short supply as compared with low oil-yielding seeds.

The annual European requirements following the cessation of hostilities are estimated to be not less than 3,250,000 tons of oil equivalent. After a survey of production in countries under Allied control, or neutral, but excluding those under Japanese control, the author estimates potential oil supplies available for export to Europe as follows:—

"Straight" oils	625,000 tons.
Copra	130,000 ,,
Palm kernels	340,000 ,,
Groundnuts	725,000 ,,
Indian rapeseed	15,000 ,,
Cottonseed	90,000 ,,
Sesame seed	50,000 ,,
Linseed	600,000 ,,
Argentine sunflower and other seeds ..	150,000 ,,
Total as oil ..	2,725,000 tons.

The total falls short by 525,000 tons of the estimated minimum annual requirements of Europe, but it is pointed out that once the Far Eastern war comes to an end the shortage will be eased very considerably by the release of nearly 900,000 tons of copra annually.

On the other hand the author draws attention to the production of soya bean in the United States which has increased from 400,000 tons in 1931 to 5,600,000 tons in 1942. Substantial quantities of soya are used for direct feeding, human and animal, nevertheless direct imports of oil were reduced from 1,000,000 tons in 1937 to 500,000 tons in 1939, and it is possible that after the war the United States may cease to be an importer of oil and may even become a net exporter. —C.H.

EXTRACTS.

SYNTHETIC MILK.

A RESEARCH chemist who has done valuable work for the [Ceylon] Coconut Board has suggested a solution of the Island-wide milk problem by the preparation of a synthetic substitute, composed of easily obtained ingredients, and possessing a high percentage of the nutritive value of cows' milk. His *ersatz* milk, he states, may be made up of coconut milk providing fat, green gram soup providing protein, and a little sugar to please the palate. Reinforcement with mineral salts like calcium, iron and phosphorus and also certain vegetable extracts would provide the necessary vitamins. He claims that the composition of the liquid would be such that it would yield the same amount of fat, etc., as is yielded by cows' milk He adds that no further boiling would be necessary before consumption, but the "milk" could be diluted if necessary for the feeding of infants.

—*Crown Colonist*, June 1944.

DIAGNOSIS OF MINERAL DEFICIENCIES IN PLANTS BY VISUAL SYMPTOMS.

THE diagnosis of mineral deficiencies in plants by simple methods and observations has come much to the fore in recent years. Time honoured chemical methods directed to soil and plant analysis, even including the more recent spectographic approach, are time consuming and can hardly be considered as simple diagnostic tools available to the non-technical though none the less careful observer. It is with pleasure therefore that we welcome this well written concise account of the *Diagnosis of Mineral Deficiencies in Plants by Visual Symptoms* written by Dr. T. Wallace of the Long Ashton Horticultural Research Station, England, and published by His Majesty's Stationery Office at 10/- (sterling).

In Technical Communication No. 39, the Imperial Bureau of Soil Science has collected all the scattered information dealing with the minor elements of the soil but that excellent publication is written for technical experts and is not illustrated.

The book under review "has been written primarily for the use of technical officers and advisers concerned with problems of crop production, and for progressive farmers . . . ." and as such can be highly recommended. The subject matter is covered in five excellently written chapters and is profusely illustrated with colour plates depicting deficiency conditions in indicator plants. The publication is well indexed and singularly free from errors.

It is natural that a tropical reviewer would hope to see colour-plates dealing with deficiency manifestations affecting tropical plants and reference made to suitable tropical indicator plants. It is realized however that the work is intended primarily for use in temperate climates and as such meets every requirement both technical and educational. —W.J.B.

SCIENCE GOES TO WAR ON BRITAIN'S FARMS.

By
WILLIAM ALLISON.

WHEN Hitler is finally defeated, and the tanks and guns give place again to the tractors and the plough-shares, Britain will still be the bridgehead for perhaps the biggest battle of all—the vast and urgent task of bringing food to Europe's starving millions.

The Allied Armies must not only bring liberation; they must bring bread. Sicily taught us that. High above the shouts of welcome for our troops in every Sicilian town was heard the cry: "Give us food," and that cry will be echoed in every corner of Europe as the Germans are rolled back from the lands they conquered.

But beyond this task of fulfilling immediate food needs lies the much greater one of seeing that the farms and fields of Euorpe, impoverished and plundered by the Nazis, are re-stocked and re-sown again as quickly as possible. Experts in Britain, Canada, the United States, and Russia, are working against time to ensure that the terrible cry of "famine!" shall not be the epilogue to Nazi occupation.

Foremost among the British scientists working to this end is Sir John Russell, world famous agricultural scientist, and for 31 years Director of the even more famous Rothamsted Experimental Station. In this quiet Hertfordshire house, and on the experimental farm which surrounds it, Sir John and his associates have evolved the scientific principles that have done so much to defeat Hitler's dream of starving Britain into surrender. To the enthusiasm and toil of this team of men, the people of Britain owe the millions of acres of home-grown crops which have kept them adequately fed throughout the war.

The stupendous achievement of British farmers in producing, under war-time conditions, the greatest harvests ever known in Britain, would never have been possible without the help of Rothamsted's scientists. Here are some of the things they have taught the farmer:—

1. New methods of circumventing the ravages of pests and diseases, which in peace-time destroyed about ten per cent of the country's crops. Rothamsted's teaching is that prevention is better than cure, and where pests cannot be killed, ways have been discovered of preventing the damage they do.

Wire-worm, for example, is one of the farmer's deadliest and most costly foes. Before the war, this pest often destroyed one-fifth of the wheat crop in some areas, a serious loss at any time, but disastrous to a nation at war. Somehow it had to be checked, or stopped, if Britain was to get her war-time bread.

So Rothamsted set to work and discovered a way of estimating accurately the wire worm population in any given area of ground. As a result, if the wire worm content is high (there may be as many as one and a half millions to an acre) farmers are advised against growing wheat or potatoes in that particular field, but to sow beans or flax, which are almost immune from wire worm.

If the infestation is medium, barley can be grown, if it is low, the wheat crop will be safe. Thus, in one direction alone, Rothamsted has saved from 10 to 20 per cent of wastage in crops grown since the war.

Sir John Russell revealed this fact while, at the close of this summer, Britain's farmers were beginning to gather in yet another bumper harvest.

2. Increased skill in the use of fertilizers. Research at Rothamsted's laboratories, with samples of soil from all parts of the country, has produced priceless information. To-day, an agricultural officer in any county can make a quick test to find out just how much lime or phosphates the soil needs. This means that Britain's limited supplies of fertilizer can be applied in exact proportion to the requirements of the ground.

Here is one instance of Rothamsted's specialized advice. They recommended the use of salt for the production of sugar beet. It was found that 25 tons of agricultural salt applied to the soil yielded an extra 25 tons of sugar beet to the acre.

3. Inoculation of seed. Rothamsted's scientists set to work to find out why some fodder crops always failed on certain types of land. Experiments showed that this was because the bacteria vital for their growth was deficient in the soil. The crops mainly concerned were clovers, peas, beans, lucerne, and vetches. In the early stages, experiments were made by introducing the bacteria straight into the ground, but Dr. Thornton, of the Rothamsted Soil Micro-biology Section, discovered a method of inoculating the seeds with the necessary bacteria before sowing, so that, as the plants grew, the bacteria would propagate and help produce an abundant crop.

These are but three phases of Rothamsted's great contibution, not only to British agriculture, but to farming progress all over the world. By their pioneer experiments and research, Sir John Russell and his associates have opened up a vista of a happier post-war world in which there will be food in abundance for all.

It is fitting that in this year [1943] of its most astounding achievements Rothamsted is celebrating its centenary. For a hundred years, its succession of scientists, often labouring against prejucide and obstinacy, have worked patiently and quietly to bring the gospel of soil science to the farmer. To-day, there's hardly a farmer in Britain who would not readily acknowledge that, but for the teachings of Rothamsted, he could never have produced the high quota of war-time crops asked for by the British Minister of Agriculture.

And now, as the armies of the United Nations stand poised for the final death-blow against Germany, the scientists are getting ready to help the farmers of Europe. They do not underrate the task. They know that Britain may have to supply, as Sir John Russell recently estimated, some half-a-million tons of seed potatoes, a similar quantity of cereal seed, as well as seeds of vegetables and fodder crops.

Already, the men of Rothamsted are carrying out experiments to ensure that the seeds we send are suitable for the countries in which they are to be sown. And as they work, they see through their test tubes and bottles the seeds of the future, when the fair fields of Europe will once again be crowned with golden corn instead of the Nazi jack-boot.

—British Council, Press Division No. 928, 18th Nov. 1943.

WORKING FOR OUR FOOD.

"As nearly as I can estimate, we are likely to get one million tons more bread-corn and over a quarter of a million tons more potatoes than even last year's [1942] record. That in itself means a saving of enough ships to transport overseas vehicles, supplies, guns, ammunition and equipment for some eight to ten divisions. And that is merely this year's increase over last year's. So you can picture for yourselves what last year's prodigious total means. And so you see that the fields of England had quite a lot to do with the collapse of Italy. That great mass of food was raised from the soil of this country. For agriculture is the art and science of producing food from the soil—in our case, food for our own people from our own soil. Never forget that, whether you are a country man or a townsman.

As I said, we shall by the end of the year [1943] have gathered the greatest harvest that the country has ever known. And because we have had every month to give up more and more land for aerodromes, battle training grounds and such-like purposes, we have actually grown that large amount of food from the smallest acreage of land devoted to agriculture known since official records have been kept."

Rt. Hon. R. S. Hudson, Ministry of Agriculture. *The Listener*, 28th October, 1943.

WHAT A GOOD EDITOR OUGHT TO BE.

A GOOD editor is one who has never made a mistake; who has never offended anyone; who is always right; who can ride two horses at the same time he is straddling a fence; with both ears to the ground; who always says the right thing at the right time; who always picks the right horse to win; who never has to apologize; who has no enemies, and who has worlds of prestige with all classes, creeds, and races. There never has been a good editor.

—*Minnesota Press* (U.S.A.)

MITES AND DUST.

Two entomologists and a naval surgeon in Ceylon have made a discovery which may mean an important advance in the treatment of bronchial, asthmatic and other respiratory diseases. Mites which have been detected in the sputum of bronchial sufferers are believed to have been inhaled into the lungs and bronchi, where they breed. The mites were found abundantly in dusty houses and in places where food and grain were stored, as well as on certain species of flowers. It was found that arsenical preparations quickly destroyed the mites and put an end to the symptoms. A paper on the subject has been published in the *Indian Medical Gazette.*

Crown Colonist, July, 1944.

THE USE OF SAWDUST IN THE GARDEN.

WILL the addition of sawdust to soil have a harmful effect on the soil or crops ? Is sawdust of any value in loosening heavy clay soils ? Is sawdust satisfactory for increasing the organic content of sandy soils ? Can sawdust be used as a mulching material ? What is the fertilizing value of sawdust ?

Sawdust has virtually no fertilizing value. It is very low in plant nutrient supply and the availability of these is also low. By itself sawdust may have a depressive action on plant growth because it supplies soil micro-organisims with food and energy but not with nitrogen which they must then draw from the soil, thus robbing plants of this necessary nutrient.

Both heavy and light soils will, however, benefit in physical condition from admixture with sawdust; heavy soils will be loosened and become easier to work while light soils will be given more "body" and become more retentive of water. Applied as a mulch sawdust will protect moist soil from the drying effect of sun and wind, and will reduce surface run off. In order to offset the drain on soil nitrogen caused by the addition of sawdust to soil it is necessary to add nitrogenous fertilizer at the same time, and the authors recommend sufficient to give the sawdust the equivalent of 2 per cent of nitrogen. This would be achived by the addition of 1 lb of nitrate of soda or 2 lb blood and bone meal to 10 lb of sawdust.

Bulletin No. 605, 1939, of the *Ohio Agricultural Experiment Station* (Salter, R.M. and Schollenburger, C.J., Farm Manure) as reprinted in *Tropical Agriculture*, Vol. XXI, No. 3, March 1944. —C.H.

SOIL SCIENTISTS ON THE BEACH HEADS.

MONTHS before the invasion, parties of civilian scientists landed on the beaches of Normandy to prepare the way for the great assault, it was revealed at S.H.A.E.F. last night. They went to secure samples of the sand and soil so that when the landing craft sailed in and the tanks and lorries drove ashore their drivers would know what they were going into and be prepared to meet it.

For the most, said a civilian expert telling the story of the exploit, the sand was firm, but there were patches where the clay base came to the surface.

" Observations and old French books—some before the 18th century—indicated that underneath the sand was clay and peat, and in some places the clay was showing," he said.

" Some very bright lads got over nicely and quietly by night, causing no disturbance and attracting no notice. They crawled half a mile on their bellies on the beach with special instruments taking samples and charting the positions of the soft patches, then brought the results back to England."

Trials were carried out along similar beaches in Britain.

Scientists in the same way obtained information about the exact nature of the beach obstacles, reproduced them as nearly as possible, set them up on British beaches and conducted invasion exercises against them.

Close study was also given to the flooding problem in the invasion area.

—*Observer*, London, 16th June, 1944.

VALEDICTORY.

Dr. H. W. Jack, O.B.E., D.Sc., B.A., Director of Agriculture.

Readers of this *Journal* in Fiji will already have learned with regret of the departure on leave pending retirement of the Director of Agriculture, Dr. H. W. Jack, a regret that is shared by members of the staff of the Department of Agriculture.

Dr. Jack was appointed as Director in July, 1934, after 20 years' service in the Malayan Department of Agriculture, and arrived in this Colony in September of that year; he had thus completed nearly ten years' service in Fiji at the time of his departure and a total of 30 years in the Colonial service.

Dr Jack had wide interests in the agricultural field but his Malayan experience led him to take an especial interest in the copra industry, and coconut planters will be well aware of the efforts he made to improve the quality of Fiji copra and to secure for it a higher rating in the world's markets. He was ever ready to give personal assistance to planters and, during the difficult war period especially, did not spare himself in efforts to secure the necessary materials and other facilities required in connexion with the industry.

During his term of office Fijian agricultural production was given great encouragement, and Dr. Jack took a close personal interest in those Fijians who were seeking to set themselves up as peasant farmers, more particularly were they encouraged to keep livestock, a branch of farming which is generally neglected by them.

The war intervened at a time when many of the late Director's schemes of development could have been expected to show results, but he threw himself into war work with characteristic energy and, as Controller of Production and Marketing, was immediately responsible for the stimulation of local production to meet the expectation of greatly reduced imports of foodstuffs and other necessities. From the inception of the control system in 1939 until the increasing pressure of work required the setting up of separate control offices in 1942, Dr. Jack was Controller of Prices, Petrol and Tyres, Materials, Reserve Foodstuffs, Exports, and Chairman of the Fiji Copra Board, and he made a great personal effort in successfully initiating and carrying out these onerous duties over a long period. It was a disappointment to him that these duties of necessity curtailed his opportunities for visiting country districts and maintaining personal contact with planters and farmers.

In 1941 His Majesty honoured Dr. Jack by appointing him an Officer of the Order of the British Empire.

Despite his manifold duties Dr. Jack kept up his outside interests to the end of his period of residence in Fiji. He was at various times a member of the Board of Trustees of the Fiji Museum, Chairman of the Fiji Publicity Board and President of the Suva Rotary Club. His services to the Church, to charitable institutions, to education as Chairman of the Suva School Committee and a member of the Board of Education, and to rugby football, will be greatly missed, as well as in his wide hospitality to Allied and other servicemen to whom he extended open house.

Our readers will join us in extending to Dr. and Mrs. Jack our wishes for a happy and well-deserved retirement. —C.H.